D 6.3. Working paper on co-creation teaching as instrument for fostering responsible engineering

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How can technical universities help to create a workforce that meets the challenges of complex global problems that cut across technology and society? How can we support the professional development of future engineers? How can we effectively upscale co-creation teaching practices?
These are some of the questions we aim to address in BoostEuroTeQ – a scientific research project funded by EU Horizon 2020. As a complementary project of the Erasmus+ funded EuroTeQ Engineering University our goal is to encourage institutional change towards responsible research and innovation. The multidisciplinary project brings together engineering education, philosophy, ethics, and science and technology studies.
Over the course of three years (2021-2024)
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BoostEuroTeQ
Enabling individuals
Supporting the lifelong learning journey of European professionals by conceptualising new professional profiles
- Analyse the developmental needs of the engineers of the future
- Develop a strategy for the upskilling of professional engineers at universities
- Create tailor-made training programms in close collaboration with institutional and industry partners
- Conceptualise training for Learning Professionals with the aim to qualify them as specialists in the scientific upskilling of engineers
Societal transformation
Augmenting the transformative potential of universities in society by investigating co-creation practices and developing context-sensitive strategies for their reflexive institutionalization
- Create a EuroTeQ Co-Creation Manifesto on institutional strategies that will enhance the evolution of responsibility practices at technical universities
- Support the development of learning networks to increase co-creation practices in each community
- Conduct stakeholder engagement events on responsibilisation instruments at EuroTeQ partner universities
- Investigate the benefits and challenges as well as identify potential indicators for successful co-creation teaching at universities
- Develop a roadmap for the upscaling of co-creation teaching practices
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EXECUTIVE SUMMARY

This working paper explores the requirements of co-creation teaching across EuroTeQ universities, focusing on the unique institutional and cultural contexts that shape engineering education. It discusses the historical, political, and societal roles of engineers in each region and how these factors influence the adoption of participatory and democratic technology development. The paper identifies the strengths, barriers, and areas for improvement for co-creation teaching. We focus on cultural-political histories of engineering education, specific notions of social responsibility and ethics, and the role of industry collaborations and civil society engagements. Tailored to each university's capabilities and challenges, we end with recommendations for enhancing co-creation teaching to better prepare socially responsible engineers who are adept at working with diverse stakeholders across European contexts. Overall, the working paper advocates for a nuanced understanding of each educational setting to effectively implement and benefit from co-creation in engineering curricula. The upcoming academic paper linked to this deliverable is aimed at a high-impact journal and develops selected insights mentioned in this working paper further.

1. SOCIAL RESPONSIBILITY IN ENGINEERING EDUCATION ACROSS EUROPE

How can educators from diverse cultural backgrounds effectively teach social responsibility-oriented Science and Technology Studies (STS) in engineering programs across different national and institutional contexts? This question is crucial given the international push for creating responsible engineers, embedding science and society curricula, and involving more stakeholders in producing responsible innovations. Technical universities are increasingly urged to cultivate socially responsible engineers, a concept encompassing various aspects from sustainable development goals (SDGs) to technology acceptance. In the U.S., ABET emphasizes inclusion, diversity, and equity as critical to global competitiveness and sustainability (ABET 2021). Similarly, the EU's Rome Declaration aligns research and innovation with societal values, while ASEAN countries are broadening their technology and society education (Archibugi and et al. 2015; Mohd Yusof 2015). To meet these demands, engineering education bodies integrate STS or related courses into their programs.

With increasing attention on the societal impacts of technologies, universities are incorporating social aspects into technical curricula, either through in-house development or by hiring STS scholars (Leydens, Lucena, and Riley 2022). The EU has funded initiatives like the BoostEuroTeQ project to, amongst others, apply an STS lens to explore how co-creation can enhance engineering education by involving a wider array of stakeholders. Such efforts aim to address global challenges by combining technology and societal perspectives. However, teaching social justice in engineering varies across cultures, necessitating an understanding of one's positionality and the national and institutional political context. This calls for recognizing institutional contexts and designing STS interventions that align with local and historical understandings of social responsibility (Wisnioski 2015; Spindler and Hammond 2012).

This working paper shares the outcomes of investigation across all EuroTeQ universities in a concise form. The academic paper linked to this deliverable is aimed at a high-impact journal and develops selected insights further. More specifically, in the upcoming publication (authored by Monamie Bhadra Haines and Corinna N. Voll), we examine the co-production of social responsibility and engineering education practices in three EuroTeQ universities in more depth. The academic paper thus focuses on the co-production of social responsibility in engineering education, bridging social responsibility to the respective political pedagogical histories of the countries.

2. COMPARING COUNTRY AND INSTITUTIONAL CONTEXTS ACROSS THE EUROTEQ ALLIANCE

A comparison, paired with the specific political historical data allows for a unique insight into the strengths and weaknesses of the EuroTeQ University Alliance and is a necessary requirement before upscaling co-creation activities. Understanding the unique contexts and differences across institutions becomes increasingly important, especially with growing demands for student and teacher mobility. This comparative approach allows for a deeper insight into how responsibility is taught and perceived beyond merely transferring concepts from one institution to another. The need for this approach is highlighted in the social sciences, which call for more sensitivity for cross-cultural issues through attentive comparisons (Furlong and Lawn 2011). Our analysis further underscores the necessity of contextualizing European values within specific educational settings and thus allows us to design locally effective co-creation interventions.

The EU implemented University Alliances to enhance the international competitiveness of European higher education and to infuse "European values and identity" into education (European Education Area, n.d.). Established in 2020, the EuroTeQ network connects six leading European technical universities: the Technical University of Munich (TUM), the Danish Technical University (DTU), Technical University of Eindhoven (TU/e), École Polytechnique (l'X), Tallinn Technical University (TalTech), and the Czech Technical University in Prague (CTU). While TUM and DTU have a history of participation in elite engineering alliances like the EuroTech Alliance, the EuroTeQ network uniquely includes Eastern European and Baltic universities. BoostEuroTeQ, a sister project to EuroTeQ, aims to strengthen institutional capacities for responsible research and innovation, focusing on co-creation between students and external. Data emerged from within the BoostEuroTeQ project through interviews with university representatives, historians, pedagogical experts, academic literature, and institution-specific documents. The list of interviews can be found on the last page of this document.

3. RESPONSIBLE ENGINEERING IN CONTEXT: NATIONAL AND INSTITUTIONAL SETTINGS

The following gives an overview of relevant highlights per university, forming the backbone for effective teaching interventions. For each university, we list contours of the specific institution's national contexts - Germany, Denmark, Estonia, France, The Netherlands, and Czech Republic - which shape the role of engineers, higher education, ethics and social responsibility. For each university, we list specificities of the institutional context which impact co-creation, the relationship to outside stakeholders, characteristics related to the institution's self-understanding in regard to responsibility, and teaching set up. The insights are summarized in Table 1.

TUM – Germany

In the early 20th century, German engineers notably elevated their societal status from being viewed merely as technicians to becoming recognized as key carriers of cultural and value-driven initiatives (Herf 1986). This transformation marked a significant shift in the perception of the engineering profession in German society. However, during the Third Reich, an important and controversial period in German engineering history emerged, where engineers maintained a stance of value neutrality while simultaneously participating in the misuse of technology (Downey, Lucena, and Mitcham 2015). This involvement demonstrated the ethical dilemmas and moral challenges engineers faced while operating under a totalitarian regime that demanded technological advancements often at the cost of ethical integrity.

Following World War II, there was a significant and decisive movement towards reforming the ethical landscape of engineering. This period led to the establishment of Responsible Research Ethics for Engineers, a new ethical framework that mandated engineering practices to prioritize the benefits to humanity above all (Downey, Lucena, and Mitcham 2015). It emphasized that technical laws and regulations must not only follow but also promote ethical principles, ensuring that the engineering profession contributes positively to societal well-being and moral progress.

A significant focus at TUM is placed on human-centered engineering and the integration of social sciences, emphasizing the role of social responsibility in engineering practices (Prof. Dr. Hofmann 2021). Additionally, it boasts the largest Science & Technology department across EuroTeQ promoting co-creation research. In regard to its responsibility to the local ecosystem, TUM maintains strong connections with industry and third-party funding, exemplified by its close ties with the local automotive industry (I1). The institution places a strong emphasis on internationalization and attracting elite talent from abroad while acting as the central coordinator for many EU-related projects like EuroTeQ. A central unit for teaching & learning is TUM's ProLehre Media & Didactics, which operates without adherence to any specific educational philosophy, but has developed its own guidelines (I1).

DTU – Denmark

Denmark's cultural and scientific landscape has been significantly shaped by notable figures such as Grundtvig and Ørsted, each bringing a unique perspective to education and national identity. Grundtvig's influence is profound in the realms of folk education, promoting the role of the church and cultural heritage, emphasizing the development of a strong national identity. In contrast, H.C. Ørsted championed the advancement of scientific research and education, advocating for knowledge creation through empirical inquiry, aimed at societal progress (I2). DTU, deeply influenced by its founding father Ørsted, places a significant emphasis on elite natural science research, setting a high standard in its theoretical academic pursuits.

Denmark is furthermore famous for its tradition with democratic forms of engagement and being a frontrunner in digitalization. The general attitude towards new technology is notably positive, supported by trade union federations, reflecting a broader societal acceptance and enthusiasm for innovation (Ehn 1993). The country also exhibits a distinct tradition in participatory design, particularly strong within Scandinavian contexts, where there is an explicit emphasis on integrating values into design processes (Gregory 2003).

There is an evident contrast between Denmark's universities, with institutions like Roskilde and Aalborg focusing on applied knowledge, while the Danish Technical University maintains a more theoretical tradition, while also having a strong focus on research outcomes relevant for local industry (I3). The institution is characterized by a strong corporate orientation, maintaining robust collaborative frameworks with various industries, and emphasizes sustainability research and technological development, using Sustainable Development Goals (SDGs) as benchmarks for responsibility (I4). Additionally, DTU Skylab stands as a flagship for innovative centers, setting a trend that has inspired similar initiatives across the EuroTeQ network. Here, initiatives such as "Technology Leaving no one behind" are hosted, which build on inclusive design principles. The DTU Learning Lab acts as the central pedagogical unit, enhancing teaching across the university with training programs profoundly inspired by educational theorist Guy Brousseau (I3).

TalTech – Estonia

Post-Soviet restructuring from 1991 to 2000 marked a significant transformation in Estonia in various sectors, guided by market logics and international financial actors (Heyneman 2010). This period also saw a strategic consolidation of smaller research entities into larger units to enhance economic efficiency (I5). In terms of educational ethos, the Soviet era framed ethics in STEM education primarily as a practical necessity to fulfill engineering duties, with little emphasis on the philosophical underpinnings of such inclusion (Pevkur 2010).

The entrepreneurial spirit is alive in Estonia with a robust startup culture, alongside a strong push towards digitalization and automation. A “small country” dynamic has been frequently mentioned, where government officials are readily accessible for educational contributions (I6). However, challenges persist in academia-industry collaborations, predominantly due to industry expectations of receiving "ready-made" engineers without further time investment in their training (I6). Many students are already engaged in work alongside their studies, indicating a blend of academic and professional experiences from an early stage (I5).

The FinEst center for smart cities exemplifies successful interaction between research, public sectors, and private entities, moving beyond mere digital mapping to embrace participatory methods (I7). A strong commercial mindset is visible here, where all innovation outcomes are aimed to be scaled and marketable. There is also a pronounced international ambition to connect with broader European university networks and EU integration efforts (I6). While teaching support is decentralized across various units, each faculty manages a small, autonomous didactic unit, reflecting a non-centralized approach to educational support (I5). Historically, teacher training was not mandatory, pointing to a more informal approach to pedagogical development within the educational framework (I5).

L'X – France

The engineering profession is highly esteemed in France, where the educational system emphasizes mathematical mastery as a core component of engineering training, valued for its ability to predict future outcomes and maintain social order (Downey, Lucena, and Mitcham 2015). This tradition is embodied in institutions like École Polytechnique, recognized as one of France's most prestigious technical schools. Entry into such schools typically requires completion of rigorous two-year preparatory courses, with a heavy focus on mathematics, a standard practice across France's Grandes Écoles (I8).

The advent of internationally oriented programs in France has been met with some resistance, reflecting a cautious approach to integrating global perspectives into a traditionally structured educational system (Downey, Lucena, and Mitcham 2015). Meanwhile, educational designers are actively working to transition from traditional passive learning methods to more dynamic, active learning strategies (I8). This shift is part of a broader educational transformation, which has also seen an increase in demand for online and hybrid teaching formats following the Covid-19 pandemic.

However, the transition to more innovative teaching methods faces challenges, notably due to a student body accustomed to rote learning rather than creative engagement (I9). The French educational system is marked by a strong hierarchical structure where the teacher is often revered, akin to a "star," reinforcing traditional roles and methods. Additionally, there's a significant governmental influence, notably from the Ministry of Armed Forces, which even extends to holding rights over patents developed by students, indicating a close tie between education, government, and the military sector (I9).

TU/e – The Netherlands

Since the 1970s, there has been a gradual but significant shift toward incorporating ethical awareness within engineering education in the Netherlands. Initial attempts in the late 1970s to integrate Science, Technology, and Society (STS) courses highlighted the societal impacts of technology but struggled with lasting integration due to issues related to institutional support and clarity of educational objectives (Brumsen 2005). The 1980s and 1990s saw further developments, notably with the establishment of the Rathenau Institute and changes spurred by the Higher Education Act, which formally introduced ethics into engineering curricula (Brumsen 2005).

The educational system within this context is described as highly managed, with an increasing focus on integrating predictive metrics for student development across the country (I10). Alongside this, there has been a broad adoption of challenge-based learning across TU/e, although the depth of implementation still varies from department to department (I11). This pedagogical approach is part of a wider educational strategy to engage students more actively in their learning processes.

The university's strategic location in the Netherlands' brainport region positions it as a leader in digital innovation and public-private partnerships (TU/e 2024). This region is renowned for its advanced technological developments and collaborative efforts, which are reflected in the university's educational approach. The institution boasts a high level of collaboration with industry, exemplified by a greater frequency of co-authorship with industry partners compared to other EuroTech universities (Malkov, Dumoulin, and Westenbrink 2024). This collaboration not only enhances the practical aspects of education but also bridges the gap between theoretical knowledge and real-world application, fostering a rich environment for innovation and learning. At the same time, recent months have seen a shift in student's bottom-up engagement, where various protests across the Netherlands have been initiated to challenge the neutrality of industry collaborations, indicating an increasingly socially and environmentally critical student body (I11).

CTU – Czech Republic

In the Czech Republic, the approach to engineering education has evolved to integrate humanistic and social elements, aligning with international trends toward a more comprehensive educational framework (Vališová and Andres 2015). Institutions in the country have established specialized studies in engineering pedagogy, which are specifically designed to bridge the gap between technical expertise and essential pedagogical skills, preparing engineers not just as technicians but as educators and leaders within the field (Vališová and Andres 2015). Despite these advancements, the predominant educational culture in Czech technical training remains rooted in traditional, teacher-led instruction, where the emphasis is on discipline and rote learning, posing challenges to the adoption of more interactive and process-oriented teaching methods (I12).

The Czech Technical University is the only EuroTeQ university highlighting the integration of marginalized groups (Czech Technical University 2021), however, broadscale systematic integration into its educational offers could be expanded. Most collaboration is undertaken with industry in mind, such as the Formula One event, which exemplifies the potential benefits of partnering with external entities to enhance practical educational outcomes. Meanwhile, the prevalent teaching style at Czech universities continues to be conventional, with limited exposure to innovative teaching methods, although there is a concerted effort to shift towards more integrative and challenge-based learning approaches (I13).

Further illustrating the commitment to a broadened educational scope, the Masaryk Institute of Advanced Studies at the Czech Technical University in Prague stands out as a central institute providing a variety of additional courses to the engineering curriculum. These include pedagogy, didactics, school counseling, and coaching, all aimed at enhancing the educational capabilities of its students (Czech technical university in prague 2015). Additionally, the university's courses in Urban Studies and Architecture are notably connected to civil society and human-centered development, indicating a strong focus on societal impact and relevance (I13). These programs underscore the university's dedication to producing not only skilled engineers but also well-rounded individuals capable of addressing complex societal challenges.

Table 1 gives an overview of relevant highlights.

Table 1 - Summary of relevant country and institutional context to contextualize co-creation teaching and the role of engineers and responsibility

LOCATION	COUNTRY CONTEXT IMPACTING ENGINEERING, EDUCATION AND SOCIAL RESPONSIBILITY	INSTITUTIONAL CONTEXT IMPACTING CO-CREATION & TEACHING
TUM – GERMANY	- In early 20th century, German engineers increased their status from “mere technicians” to carriers of culture and value - Third Reich as an important milestone in German engineering history where engineers focused on their value neutrality, but also actively participated in misuse of technology - Strong reform in Responsible Research Ethics for Engineers post WWII with a new primary focus on the benefit of humanity – technical laws and regulations must not contradict ethical principles	- Strong connections with industry and third-party funding (e.g. local automotive industry) - Strong focus on internationalization and attracting Elite talent from abroad - Central coordinator of many EU related projects, such as EuroTeQ - Focus on human-centered engineering and the integration of social sciences - Largest Science & Technology department across EuroTeQ with a focus on co-creation - ProLehre Media & Didactics as key unit, no specific educational philosophy or “Guru” - Ethics courses broadly included in the cours ecatalogue
DTU – DENMARK	- Denmarks cultural and scientific history largely influenced by two prominent actors; Grundtvig emphasized folk education, church, and culture to foster national identity. Ørsted focused on scientific research and education, knowledge creation empirical inquiry for progress. - Strong Scandinavian participatory design history with explicit emphasis of values in design - Differences between more applied universities (Roskilde, Aalborg) and more theoretical tradition (DTU) - Generally positive attitude towards new technology from the trade union federations	- DTU particularly influenced by Ørsted (founding father), and a focus on elite natural science research - Strong corporate orientation, collaboration, and frameworks with industry - Strong focus on sustainability research & tech development, use of SDGs as “responsibility” signposts to industry - DTU Skylab as flagship for innovative centers which has inspired other such initiatives across EuroTeQ, hosting inclusion-oriented initiatives such as “Technology Leaving No One Behind” - DTU Learning lab as central pedagogical unit runs university wide uDTU teaching training highly inspired by Guy Brousseau; teacher as scaffolder of classroom interaction - Few explicit courses on “ethics”, ethics are “done” through user engagement
TALTECH – ESTONIA	- Restructuring after end of Soviet Union, 1991-2000 brought strong changes based on market logics and international financial players - Post-soviet times brought a fusion of smaller research units toward bigger ones as part of economization	- “Small country” characteristic where individuals from government are easy to reach for university teaching - Industry collaboration does not work easily in general (skepticism), since industry expects ready-made engineers without wanting to invest too much - Most students already work during their studies

	- Ethics in STEM education in Soviet times was framed as necessary practical achievement to perform engineering obligations to serve society – missed larger reflection on why ethics should be included - Engineering university's unique role is seen in its support for StartUps and in building university spin-offs - Country-wide strong focus on digitalization and automatization (e.g. autonomous electric vehicles)	- FinEst center for smart cities as exemplary model of research-public-private interaction. Increased focus on participatory methods beyond "purely" mapping the digital. Strong commercial orientation - Strong international focus and interest to be connected to European university networks and EU integration - Teaching support decentralized across units, small, autonomous didactic unit in each faculty - Teacher training has not been mandatory in the past
L'X – FRANCE	- Engineering as an extremely highly regarded profession in France - Engineering education puts high value on mathematical principles to predict the future and maintain social order - Initiation of internationally oriented programs has largely been received reluctantly in the past - 2-year preparatory classes (esp. maths) necessary to enter engineering education at Grandes Ecoles	- Polytechnique as one of, or the most, elite technical school in France - Educational designers work on changing "passive learning" to "active learning" - Challenges due to students being used to learn by heart, rather than engage in creative teaching - Generally more demand for online/hybrid teaching after Covid-19 - Strong hierarchical setup, where teacher holds a unique position, and can be admired as a "star" - Close connection with ministry of Armed Forces, which for instance holds the rights over patents for student innovations
TU/E – THE NETHER-LANDS	- Broader shift towards ethical awareness has been ongoing since 1970s. Late 1970s: STS courses in engineering highlighted technology's societal impacts but lacked lasting integration due to institutional and skill clarity issues. - 1980s-90s: Rathenau Institute's formation and the Higher Education Act led to ethics courses in engineering curricula - Generally highly centrally structured educational system aiming to increasingly integrate predictive student development metrics	- Challenge-based learning as pedagogical guideline integrated widely – however, not everywhere – at the university - Students have been more active than at other EuroTeQ universities in protests, which range across the Netherlands (e.g. Scientist Rebellion) - Very high level of collaboration with industry, highlights co-authorship with industry partners - Located in the Netherland's brainport region which is a frontrunner for digital innovation and public-private partnerships
CTU – CZECH REPUBLIC	- Engineering pedagogy in the Czech Republic integrates humanistic and social elements into technical education, reflecting international trends - Czech institutions offer specialized studies in engineering pedagogy, aiming to bridge the gap between technical expertise and pedagogical skills - Czech educational culture traditionally emphasizes teacher-led instruction and disciplined learning, with challenges in adopting more interactive and discussion-based teaching methods	- Only EuroTeQ university which highlights the integration of marginalized people in engineering for overcoming social disparities - Students largely used to a traditional teaching style, little innovative teaching methods - Aiming for more integration of Challenge-based learning - Formula one seen as role model of collaboration with industry - Masaryk institute of advanced studies central institute which provides courses in pedagogy, didactics, school counceling and coaching - Courses in Urban Studies and Architecture are the amongst the closest connected to civil society / human-centered development

4. OUTLOOK: UPSCALING CO-CREATION FOR RESPONSIBLE ENGINEERING EDUCATION

Understanding the unique historical, political, and societal contexts of different countries is vital for implementing effective co-creation teaching methods in engineering education. The role of engineers in society varies significantly across regions due to these factors, influencing how engineering solutions are developed and implemented. For instance, the conservative educational traditions in France, rooted in a disciplined, teacher-led instructional style, might pose challenges to the adoption of interactive and participatory teaching methods. Conversely, the expectation towards DTU teachers to be "scaffolders" of the learning journey poses a very different expectation to classroom interaction. Still, such contextual awareness does not always foreground the societal relevance and impact of engineering solutions. We see that linear upscaling is doomed to fail, when broader societal and historical perspectives are overlooked.

Each university's unique characteristics, resources, and regional connections play a critical role in shaping how it can implement co-creation teaching. For example, TU Munich's strong ties with the local automotive industry and its leadership in responsible research ethics position it uniquely to pioneer co-creative projects that integrate ethical considerations with cutting-edge technology. Similarly, TU Eindhoven, located in the Netherlands' brainport region is exceptionally positioned to leverage its geographical and industrial connections to lead in sustainable and digital technologies. These examples underscore the importance of tailoring co-creation initiatives to leverage institutional strengths and regional opportunities, allowing universities to not only contribute uniquely to their local ecosystems but also to foster educational experiences that are directly linked to real-world applications.

Specific recommendations for enhancing collaboration with civil society to foster co-creation in responsible engineering education would involve each university leveraging its strengths and regional context effectively. TUM Munich could diversify its collaborations with different tech industries by facilitating a broader integration of actors involved with tech, ensuring students understand the implications of their work from diverse societal perspectives. In general, the integration of ethics and social sciences is well advanced and backed up by top management, the coming years will show how well the integration can work throughout TUM's course offers. DTU Denmark could use its strong focus on sustainability research to add more experimental socio-technical co-creation to foster local sustainability, which focuses on socially embedded, transdisciplinary, and mutual learning (Trencher et al. 2014). This could complement the already strong research focus in quantitative sustainability. In addition, courses such as "Technology Leaving no one Behind" could broaden its perspective on critical disability studies, paying equal attention to socio-technical solutions and traditions, which allows to move beyond an overly focus on "hard tech" solutions. TalTech in Estonia could improve its collaborations by addressing skepticism in the industry about investing in education to foster partnerships that involve students in practical engineering challenges. In addition, more participatory experiments for smart city research could be developed where students could apply their knowledge gained from co-creation courses to support participatory smart city initiatives. L'X in France could focus on small-scale trials in individual courses and foster the dialogue with external partners, in order to understand which skills are needed from engineers beyond the focus on the "hard sciences", which is already very solidified. TU Eindhoven could further capitalize on its location in a digital innovation hub by fostering more participatory projects that involve a diverse subset of local communities in the technology development process. The university could also more thoroughly establish incentive structures that reward faculty for engaging in co-creation with external stakeholders. Finally, CTU in Czech Republic could strive to overcome traditional educational expectations by incorporating more community-based projects into its curriculum, thus ensuring that students are exposed to diverse societal needs and perspectives. This would also allow the university to ensure its goal of minimizing social disparities.

By aligning their strategies with local strengths and needs, universities can significantly enhance the impact of their engineering education programs. This approach embeds ethical considerations and societal needs directly into the fabric of technological innovation and development. Teacher education that is informed by a perspective as presented in this working paper can foster co-creation teaching by taking into consideration the contextual specificities of each university's uniqueness. By embracing the diverse needs, resources, and cultural backgrounds of different institutions, teacher education programs can tailor their approaches to maximize engagement and effectiveness. This ensures that educational strategies for co-creation are not one-size-fits-all but are instead adaptable and responsive to the distinct characteristics of each academic environment. Such an approach encourages collaboration between educators and students, creating a more inclusive and dynamic learning experience that respects and leverages the unique attributes of each university.

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OVERVIEW OF INTERVIEWS

Acronym (I=Interviewee)	Role
I1	Leading professional in didactics at TUM
I2	Historian at DTU
I3	Pedagogical designer at DTU
I4	Leading sustainability researcher at DTU
I5	Academic Quality Assurance representative at TalTech
I6	Professor in Public Policy at TalTech
I7	Representative from FinEst Center
I8	Educational designer at I'X
I9	Educational designer at I'X
I10	Academic evaluation officer at TU/e
I11	Postdoc in University Partnerships at TU/e
I12	Leading professional in didactics at CTU
I13	Professor in Architecture at CTU